



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,849	09/25/2003	Yang (Jeff) Jiao	372465-01501	8693
37509	7590	12/13/2005		
DECHERT LLP P.O. BOX 10004 PALO ALTO, CA 94303			EXAMINER CASCHERA, ANTONIO A	
			ART UNIT	PAPER NUMBER
			2676	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/671,849	Applicant(s) JIAO ET AL.	
	Examiner Antonio A. Caschera	Art Unit 2676	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 23-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-16 is/are rejected.
- 7) ☒ Claim(s) 8 and 17-22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I (claims 1-22) in the reply filed on 09/22/05 is acknowledged.
2. Claims 23-28 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention (Group II), there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 09/22/05.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: #82 found in paragraph 13. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Art Unit: 2676

4. Claim 13 is objected to because of the following informalities:
 - a. The phrase, "...maximum area triangular area..." (see line 2 of claim 13) should be corrected to, "...maximum triangular area..." to conform with the language of claim 9, from which claim 13 depends upon.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 2-5, 7-15 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In reference to claims 2, 3, 5 and 12, the variables "a", "b" and "c" are not explicitly defined in the claims. Although these variables are associated with a range of values (see claim 2), there is no concise meaning to these symbols and thus the claims are indefinite. Further, the claims do not particularly point out where/how these values came from/are computed. Also note, in reference to claim 2, the claim recites language equating the variable "a" greater than or equal to zero, however variable "a" is found in a multiplication of the denominator of a fraction which would render the fraction invalid if a equaled zero.

In reference to claims 4 and 5, claim 4 recites the limitation, "the equation" in line 6 of the claim. There is insufficient antecedent basis for this limitation in the claim.

In reference to claims 7 and 8, claim 7 recites the limitation, "computing the triangular area" in line 10 of the claim. There is insufficient antecedent basis for this limitation in the claim.

In reference to claims 9-15, claim 9 recites the limitation, "computing the maximum triangular area" in line 9 of the claim. There is insufficient antecedent basis for this limitation in the claim.

In reference to claim 18, claim 18 recites the limitation, "wherein the step of computing the triangular area covered by said line segment..." in lines 1-2 of the claim. There is insufficient antecedent basis for this limitation in the claim. Note, claim 16, from which claim 18 depends upon, solely claims a computing step, "...computing the triangular area not covered by said line segment..." (see line 6 of claim 16).

In reference to claim 18, the variables "p" and "sf" are not defined in the claim, thus the claim is indefinite because there is no concise meaning to these symbols.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-5 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown (U.S. Pub 2003/0210251 A1) in view of Kuchkuda et al. (U.S. Patent 5,872,902).

In reference to claim 1, Brown discloses a method for improved antialiasing coverage computation (see paragraph 1 and Figure 12). Brown discloses the method implemented within a computer graphics system outputting to a display device (see Figures 10 and 11). Brown further discloses the method applicable to line drawings in a 3D graphics system (see lines 1-2 of paragraph 17 and Figure 1). Brown discloses trying to match an ideal antialiasing algorithm by drawing a rectangle around the line segment in question, thus expanding the edges of the line segment (see paragraph 27 and #310 and 320 of Figure 3). Brown explicitly discloses different types of shading depending upon pixel centers, the shading distinguishable from a background (see #302, 304 vs. unlit pixels of Figure 3) and whether the pixels are covered by both the expanded and an unexpanded rectangle, only one or neither of the rectangles (see paragraph 27, lines 5-last line of paragraph). Note, the Office interprets such drawing of an expanded rectangle from the line segment of Brown functionally equivalent to Applicant's expanding an edge of the line segment since the expanded rectangle of Brown covers pixel centers which were previously not included in the drawing of the line segment (see for example, pixels #302 and 304 of Figure 3). Brown further discloses determining whether the pixels are included in the area covered by the expanded rectangle based upon their pixel centers and provides different shading values based upon such determinations (see paragraph 27, lines 5-last line of paragraph and #302, 304 and 306 of Figure 3). Although Brown discloses determining the area of the pixel partially or fully covered by the line segment (see paragraphs 52-63), Brown does not explicitly disclose determining a shading value based upon interpolating between the shade of the line segment and the shade of the background. Kuchkuda et al. discloses a method and apparatus for pixel blending and antialiasing via area calculation and pixel blending (see column 1, lines 10-14).

Art Unit: 2676

Kuchkuda et al. discloses expanding points representing line segments into rectangular polygons (see column 8, lines 43-45). Kuchkuda et al. then discloses slicing the polygons on scanline boundaries (see column 8, lines 59-60). Kuchkuda et al. also discloses dicing the scan lines into single pixels and areas of partially covered pixels (see column 8, lines 64-66). Kuchkuda et al. discloses calculating the area of a pixel using rectangular, triangular and trapezoidal area computations (see column 9, lines 1-11). Kuchkuda et al. then discloses processing pixlink values (comprising R,G,B, A and Z values), pixlink values output from the previous pixel area calculations, by blending such values using Z or depth values of each pixlink with older pixlink values of varying depth (see column 9, lines 17-48). Note, the Office interprets the blending of pixlink values of Kuchkuda et al. and the interpolation between shade values of the line segment and shade values of the background, functionally equivalent. It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the antialiasing pixel area calculations and pixel blending of Kuchkuda et al. with the antialiasing techniques of Brown in order to improve antialiasing in line drawing graphics processes by saving significant processing cycles having to not sort objects while still providing antialiasing using/producing transparency and depth attributes (see column 5, lines 30-64 and column 6, lines 3-5 of Kuchkuda et al.).

In reference to claim 2, Brown and Kuchkuda et al. disclose all of the claim limitations as applied to claim 1 in addition, Brown discloses the pixel centers defined by x, y coordinate values (see paragraph 30). Note, the Office interprets that since the pixel centers are defined in such x, y coordinates, the display device is inherently defined in such a manner also. Brown further discloses representing two rectangle edges parallel to the line by the equations seen in

Art Unit: 2676

paragraph 30, one of which is described as $Lo1(x,y) = Lo'(x,y)+K$. Brown further discloses the value of K equal to width of line+1/2 $((w+1)/2)$ (see paragraphs 30-31). Note, the Office interprets such an equation functionally equivalent to Applicant's $(a+b)/2a$, specifically $a=1$, and $b=w$ of Brown's above equation.

In reference to claim 3, Brown and Kuchkuda et al. disclose all of the claim limitations as applied to claim 1 in addition, Brown discloses the pixel centers defined by x, y coordinate values (see paragraph 30). Note, the Office interprets that since the pixel centers are defined in such x, y coordinates, the display device is inherently defined in such a manner also. Brown also discloses an alternate embodiment where the rectangle edges are defined by the equation $Ax+By+C=0$ (see paragraph 49). Brown discloses altering the above equation by adding a value of K or $((w+1)/2)$ to the C parameter of the equation, wherein w equals the width of the line (see paragraphs 50-51).

In reference to claim 4, Brown and Kuchkuda et al. disclose all of the claim limitations as applied to claim 1 in addition, Brown discloses the pixel centers defined by x, y coordinate values (see paragraph 30). Note, the Office interprets that since the pixel centers are defined in such x, y coordinates, the display device is inherently defined in such a manner also. Brown further discloses calculating coverage values of a pixel based upon the expanded rectangle and the pixel centers, testing whether the values are greater to or equal to zero (see paragraphs 52-56).

In reference to claim 5, Brown and Kuchkuda et al. disclose all of the claim limitations as applied to claim 4 in addition, Brown discloses the pixel centers defined by x, y coordinate values (see paragraph 30). Note, the Office interprets that since the pixel centers are defined in

such x, y coordinates, the display device is inherently defined in such a manner also. Brown also discloses an alternate embodiment where the rectangle edges are defined by the equation $Ax+By+C=0$ (see paragraph 49). Brown discloses altering the above equation by adding a value of K or $((w+1)/2)$ to the C parameter of the equation, wherein w equals the width of the line (see paragraphs 50-51).

In reference to claim 16, Brown and Kuchkuda et al. disclose all of the claim limitations as applied to claim 1 above in addition, Kuchkuda et al. discloses computing the area of a triangle not covered by the line segment and computing a difference between the total area of a pixel and the triangular area not covered by the line segment (see column 9, lines 1-11 and Figures 4 and 5). Note, since the invention of Kuchkuda et al. calculates the pixel coverage area by various additions and subtractions of covered and non covered areas by a line segment (see lines 1-5 and “Area 1” and Area 2” of Figure 5), the Office interprets that Kuchkuda et al. inherently determines covered areas greater than a predetermined limit.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902) and further in view of Wada (U.S. Patent 6,847,375 B2).

In reference to claim 6, Brown and Kuchkuda et al. disclose all of the claim limitations as applied to claim 1 above. Neither Brown nor Kuchkuda et al. explicitly disclose forming a first product of the shade value of a line segment and a fraction representing the area of the pixel covered however Wada does. Wada discloses a rendering process utilizing pixel colors of foreground and background objects multiplied by a fraction and $(1-\text{fraction})$ and summing these products to obtain a pixel value of an overlapping area of the objects (see column 2, lines 25-34,

column 4, lines 34-41 and Figure 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the fractional pixel blending techniques of Wada with the antialiasing pixel area calculations and pixel blending of Kuchkuda et al. and the antialiasing techniques of Brown in order to add semi-transparent attributes of overlapping objects to an antialiasing process without turning those semi-transparent objects opaque (see column 2, lines 5-15 and lines 38-40 of Wada).

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902) and further in view of Michail et al. (U.S. Patent 6,954,211 B2).

In reference to claim 7, Brown and Kuchkuda et al. disclose all of the claim limitations as applied to claim 1 above. Neither Brown nor Kuchkuda et al. explicitly disclose the line segment having a slope factor related to the slope of the line and a parameter proportional to an x-distance between an edge of the line segment traversing a pixel and a pixel boundary. Michail et al. discloses techniques for performing high quality per-primitive antialiasing (see column 1, lines 57-58). Michail et al. discloses rasterizing a primitive object using scanline-boundaried trapezoids, calculating the coverage for a pixel using the slope of the edges of the trapezoid along with a width of the edges and determining whether the edges are above or below the center of the pixel (see column 8, lines 2-31 and Figure 8). These edges are further broken down into triangles for further coverage processing (see column 8, lines 32-38 and Figure 9). Note, the Office interprets the parameter p functionally equivalent to the width of the edge in Michail et al. It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the antialiasing and rasterizing techniques of Michail et al. with the antialiasing

Art Unit: 2676

pixel area calculations and pixel blending of Kuchkuda et al. and the antialiasing techniques of Brown in order perform high performance graphics processing systems with the addition of full scene antialiasing techniques utilizing techniques commonly found on most graphics card (see column 1, lines 31-54 of Michail et al.).

Allowable Subject Matter

9. Claims 17 and 19-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In reference to claim 17, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose wherein the second predetermined limit is the sum of the maximum triangular area and the maximum parallelogram area of said line segment traversing the pixel, in combination with the further limitations of claim 16, from which claim 17 depends upon.

In reference to claim 19, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose computing a first area of the pixel not covered by the first parallel edge, a second area of the pixel not covered by the second edge and summing the first and second areas then subtracting the sum from one, in combination with the further limitations of claim 1, from which claim 19 depends upon.

In reference to claim 20, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose computing a first area of the pixel not covered by the first parallel edge and subtracting it from one forming a first difference, computing a second area of the pixel not covered by the second parallel edge forming a second difference and forming a product of the first and second differences, in combination with the claim limitations of claim 1, from which claim 20 depends upon.

In reference to claim 21, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose computing a first area of the pixel not covered by the first parallel edge, a second area of the pixel not covered by the second edge and summing the first and second areas then subtracting the sum from one, in combination with the further limitations of claim 21.

In reference to claim 22, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose computing a first area of the pixel not covered by the first parallel edge and subtracting it from one forming a first difference, computing a second area of the pixel not covered by the second parallel edge forming a second difference and forming a product of the first and second differences, in combination with the claim limitations of claim 22.

10. Claims 8-15 and 18 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

In reference to claim 8, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose wherein the step of computing the triangular area covered by the line segment includes forming a product $\frac{1}{2} * p^2 * (1 - sf)^{-1} * sf^l$, in combination with the further limitations of claim 8.

In reference to claim 9, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose determining the area covered by an edge of the line segment traversing through a partially covered pixel by determining whether the area is greater than a predetermined limit, computing a maximum triangular area covered by the line segment, computing an area of a parallelogram covered by the line segment and then summing the two areas, in combination with the further limitations of claim 9 and claim 1, from which claim 9 depends upon.

In reference to claims 10-15, claims 10-15 depend upon claim 9 and are therefore also objected to. The Office notes that claim 12, itself, comprises other 112 2nd paragraph issues that require attention (see above).

In reference to claim 18, the prior art of record (Brown (U.S. Pub 2003/0210251 A1), Kuchkuda et al. (U.S. Patent 5,872,902), Wada (U.S. Patent 6,847,375 B2) and Michail et al. (U.S. Patent 6,954,211 B2)) does not explicitly disclose wherein the step of computing the

Art Unit: 2676

triangular area covered by the line segment includes forming a product $\frac{1}{2} * p^2 * (1 - sf)^{-1} * sf^{-1}$, in combination with the further limitations of claim 16, from which claim 18 depends upon.

References Cited

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- a. McNamara et al. (U.S. Patent 6,329,977 B1)
 - McNamara et al. discloses a computer graphics system improving pre-filtering techniques that minimize aliasing effects in an image on a display.
- b. Taylor et al. (U.S. Patent 6,433,790 B1)
 - Taylor et al. discloses a method and system for rendering a line for display on an array of pixels, expanding the line into a polygon and determining color values within the polygon.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Antonio Caschera whose telephone number is (571) 272-7781. The examiner can normally be reached Monday-Thursday and alternate Fridays between 7:30 AM and 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella, can be reached at (571) 272-7778.

Art Unit: 2676

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

571-273-8300 (Central Fax)

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.



MATTHEW C. BELLA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

aac
ADL
12/8/05